PATENT SPECIFICATION

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DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements in Friction-Clutch Plates.

We, DAIMLER-BENZ AKTIENGESELLSCHAFT, of Stuttgart-Untertürkheim, Germany, a Company organised under the laws of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to friction-clutch plates of the kind in which a torsionally elastic connection between the disc part of the plate and the hub on which it is mounted comprises intermediate members of rubber or like elastic material, which are subjected to shear stress. Some known intermediate members have the form of a disc of uniform strength, whose axial dimension increases in the radially inward direction. These intermediate members have small adhesion surfaces, so that durability of the torsionally elastic connection is not assured, even if the shear stress is relatively low. The intermediate members are intended elastically to absorb and damp torsional vibrations of the clutch plate caused by irregularities in the driving torque.

In the selection of the material for the intermediate members, a compromise must be made between materials of high elasticity but low internal friction and materials of low elasticity but relatively high internal friction.

Due to the elastic deformation of the intermediate members under the shear stress and because of the high internal friction which is necessary for the damping, high temperatures are produced under the influence of which the said members may be destroyed after only a short operating life.

Similar disadvantages arise in a known clutch-plate arrangement in which the clutch disc has a parallel locking disc and the discs are connected by an adherent torsionally elastic layer and are engaged with each other by teeth and recesses at their edges. This interengagement is arranged to limit relative rotation between the discs and to produce the effect that, on any rotation of the clutch disc in relation to the locking disc, the two discs will move axially towards each other, compressing the elastic layer. Such clutch plates are expensive, while the evolution of heat is considerable due to the axial compression of the layer when shear stress occurs.

An object of the present invention is to provide a clutch plate in which the heat evolved will not disadvantageously affect the said members, thereby ensuring a long and reliable life in practical use.

According to the invention, a friction-clutch comprises a disc part, a hub, casing parts mounted on and rotationally fast with the hub and spaced from the disc part which they embrace between them, torsionally elastic connection means having the form of an annulus or sectors of an annulus completely or substantially completely encircling the hub and interposed between each of the casing parts and the disc part, passages for cooling air extending through the said annular connection means or between the sectors thereof, and means, additional to the said connection means, provided between the disc part and a said casing part for damping torsional vibrations of the disc part in relation to the hub, the connection means being made of soft rubber or like soft elastic material having low damping power and being firmly connected by adhesion over their side surfaces to the respectively adjacent side surfaces of the disc part and casing parts. In this arrangement, a large volume of the soft elastic material can be provided and can be connected by adhesion to the plate and casing parts over large surfaces. Advan-

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tageously, the connection means substantially fills the annular spaces, between the plate and casing parts, bounded by the hub and the inside of the clutch linings.

By using, for the connection means, a large volume of soft elastic material of low damping power, the quantity of heat evolved per unit mass as a result of the deformation under shear stress is kept small. This effect is enhanced by reason of the fact that the torsional vibrations are not damped exclusively by the connection means. The heat due to the damping action is therefore not produced solely in the material of the connection means and can be more effectively and simply dissipated to casing parts or to the outer atmosphere. The durability of the torsionally elastic connection is also improved by using large adhesion surfaces.

The additional damping means may comprise friction bodies guided on casing parts and pressed resiliently against the disc part. However, use may be made between the disc part and casing parts of damping means whose action depends upon the flow of a viscous liquid. Such means may comprise an annular damping member engaged in fluid-tight manner in an annular space containing the viscous liquid.

The cooling-air passages assist in limiting the temperature rise due to internal friction. The said passages may be radial and open at each end to atmosphere. Due to the rotation, a powerful flow of air is produced in these passages, so that the heat is rapidly discharged to the atmosphere.

By dividing the connection means into sectors, the surface area for the transfer of heat to the atmosphere can be advantageously increased. The sectors may be disposed between radial beads or ribs on the casing, so that the casing surfaces which are cooled by the outer atmosphere and the cooling-air passages are effectively enlarged.

Reference will now be made to the accompanying drawing, illustrating examples of construction in accordance with the invention, and in the drawing.

Figure 1 is a vertical section of a friction-clutch plate illustrating two different constructions in accordance with the invention.

Figure 2 is a partial vertical section illustrating a modification, and

Figure 3 is a section on the line III—III in Figure 2.

In Figure 1, a friction plate 11 for a motor-vehicle clutch comprises a disc part 10 and a hub 12, which are connected together in torsionally elastic manner. On respective sides of the disc part 10 there are disposed connection means in the form of annular intermediate members 13 and 14 of relatively soft rubber having a large volume and low damping power, each of said members being firmly connected by surface adhesion over the whole of its side surfaces both to the disc part 10 and to a respective casing part 15 or 16. The casing parts 15 and 16, which embrace the disc part 10 between them, are attached to the hub 12 (in a manner not illustrated) so as to be rotationally fast therewith. Between the casing part 15 and the disc part 10, on the right hand side of the centre line of Figure 1, there are disposed friction bodies 20 which act on the disc part 10 under the action of springs, as shown, in such a manner as to assist in damping torsional vibrations of the disc part 10 in relation to the hub 12. On the left hand side of the said centre line, a modification is illustrated, in which friction bodies 21 are supported radially by springs from the casing part 16 in such a manner that centrifugal force will assist in urging them outwardly against an abutment on the disc 10 and thereby exert a damping action thereon. The annular intermediate members 13 and and 14 have radial air passages 17 extending through them, which passages are in communication with the outer atmosphere through radially outer and inner apertures 18 and 19 in the casing parts 15 and 16.

In Figures 2 and 3 the disc part 10*a* is connected elastically to the hub 12*a* by relatively soft rubber sectors 22 disposed annularly between the casing parts 15*a* and 16*a*. The sectors 22 are firmly connected by adhesion at their side surfaces both to the disc part 10*a* and to a respective casing part, 15*a* and 16*a*, fixed on the hub 12*a*. Each two sectors 22 are spaced apart by a radial passage 17*a* and the sectors 22 may be disposed between radially extending ribs or beads 23 on the respective casing parts 15*a* and 16*a*.

With either of the arrangements described, the members 13, 14 or 22 may be arranged to fill the space within the casing parts 15, 16 more completely. Indeed, in order to achieve a maximum volume of soft material and as large adhesion surfaces as possible, they may be arranged substantially to fill the space bounded, axially, by the said parts and, radially, by the hub 12 or 12*a* and the inside of the clutch linings.

WHAT WE CLAIM IS:—

1. A friction-clutch plate comprising a disc part, a hub, casing parts mounted on and rotationally fast with the hub and spaced from the disc part which they embrace between them, torsionally elastic connection means having the form of an annulus or sectors of an annulus completely or substantially completely encircling the hub and interposed between each of the casing parts and the disc part, passages for cooling air extending through the said annular connection means or between the sectors thereof, and means, additional to the said connection means, provided between the disc part and a

said casing part for damping torsional vibrations of the disc part in relation to the hub, the connection means being made of soft rubber or like soft elastic material having low damping power and being firmly connected by adhesion over their side surfaces to the respectively adjacent side surfaces of the disc part and casing parts.

2. A clutch plate as claimed in claim 1, wherein the connection means substantially fills the annular spaces, between the plate and casing parts, bounded by the hub and the inside of the clutch linings.

3. A clutch plate as claimed in claim 1 or 2, wherein the additional damping means comprises friction bodies guided on the casing and pressed resiliently against the disc part.

4. A clutch plate as claimed in claim 1, 2 or 3, wherein the cooling-air passages are radial and open at each end to atmosphere.

5. A clutch plate as claimed in any one of claims 1 to 4, wherein the sectors are disposed between beads or ribs formed radially in the casing.

6. A friction clutch plate comprising the parts constructed and adapted for operation substantially as hereinbefore described with reference to either side of Figure 1 or to Figures 2 and 3 of the accompanying drawing.

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1100319 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig.1

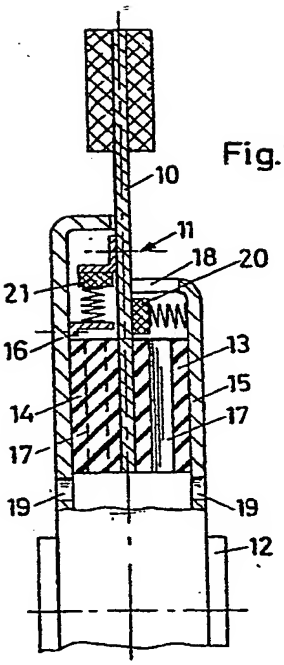
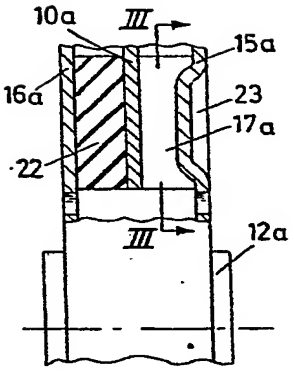


Fig.2



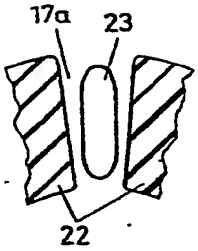


Fig.3

Price 75p